WHAT IS CLAIMED IS:

1. A method of forming diamond crystals or a diamond film comprising:

disposing a substrate in a reaction chamber; and

subjecting a vaporized precursor comprising at least one carbon containing compound having a carbon to oxygen ratio greater than one to a plasma under conditions effective to dissociate the precursor and promote diamond growth on the substrate.

2. The method according to claim 1, wherein the precursor comprises a solution of methanol and the at least one compound having a carbon to oxygen ratio greater than 1.

3. The method according to claim 2, wherein methanol is present in the precursor in an amount between about 0.5 wt.% to about 99.5 wt. % of the precursor.

4. The method according to claim 1, wherein the precursor is selected from the group comprising of ethanol, isopropanol, acetone, and combinations thereof.

5. The method according to claim 1, wherein the precursor is a solution of methanol and a compound selected from the group comprising of ethanol, isopropanol, acetone, and combinations thereof.

6. The method according to claim 1, wherein the subjecting a vaporized precursor step is conducted at a pressure between about 1mtorr and 250 torr.

7. The method according to claim 1, wherein the substrate is heated to a temperature between 300° C to about 1,600° C.

8. The method according to claim 1, wherein the carbon containing

compound further comprises a dopant element or moiety.

9. The method according to claim 1, wherein the substrate comprises a sheet or wafer of silicon, copper, aluminum, molybdenum, or alloys thereof.

10. The method according to claim 1, wherein the plasma is induced by electromagnetic energy.

11. The method according to claim 10, wherein the electromagnetic energy has a frequency selected from the group comprising of direct current, radio frequency, and microwave.

12. The method according to claim 1, wherein the plasma is induced by microwave energy.

13. A plasma enhanced chemical vapor deposition of diamond crystals and diamond films on surfaces of a substrate comprising:

providing an apparatus including an inlet, a dissociation zone, a deposition zone and an outlet;

introducing a precursor comprising methanol and at least one carbon containing compound containing a carbon to oxygen ratio greater than one into the inlet under conditions effective to vaporize the precursor, flow the precursor through the dissociation zone, and through the outlet;

dissociating and reacting the vaporized precursor as vaporized precursor flows or diffuses through the dissociation zone to produce OH, H, O, and carbon containing radicals; and

transporting the radicals to the substrate in the deposition zone to produce the diamond crystals or diamond films on the surface of the substrate.

14. The process according to claim 13, wherein the dissociation and reacting steps comprise:

passing the vaporized precursor through an electrical discharge zone for dissociating the precursor in the dissociation zone.

15. The process according to claim 13, wherein the introducing step comprises:

introducing the liquid precursor with methanol in an amount between about 0.5 wt.% and about 99.5%.

16. The process according to claim 15, further comprising:

supplementing methanol with one or more carbon containing compounds containing carbon, hydrogen, and oxygen with the atomic ratio of carbon to oxygen greater than one.

17. The process according to claim 16, further comprising:

selecting the supplementing compounds from the group comprising of ethanol, isopropanol, acetone, and combinations thereof.

18. The process according to claim 13, wherein the deposition zone is maintained at a temperature between about 200° C to 1600° C and at a pressure between 1 mtorr and 250 torr.